CASE STUDY

Blue Valley Unified School District #229
Overland Park, KS

TOPIC:

Carpets, Ventilation, Mold, and Integrated Pest Management (IPM)

Located in Overland Park, Kansas, Blue Valley Unified School District #229 serves an estimated student population of 19,000, in grades pre-K to 12, and employs 2,506 staff members. Overland Park, part of Johnson County, is located in the southwest region of the Kansas City metropolitan area and is the second largest city in the state, home to approximately 162,600 residents. The district currently maintains 29 facilities, encompassing approximately 3.5 million square feet. The district's oldest facility, built in 1919, has since been renovated and converted to office space for administrative staff. All but five of the remaining facilities were built after 1980.

Facilities are of brick construction with flat roof systems. Extreme temperatures in the region can pose a challenge to the integrity of the "building envelope" (i.e., the exterior construction and roofing system), and improper building design can sometimes cause building foundations and walls to crack. In the past several years, the district has constructed the majority of its new buildings with a modern air delivery system that is a four-pipe HVAC system, in some cases including under-floor air distribution systems. In two prototype elementary schools, Blue Valley has incorporated a displacement air concept through under-floor air delivery system at a scale which is unprecedented for school districts in the United States.

The district's first IAQ efforts in 1997 were implemented through the "Building Envelope" program, originally established to address moisture, mold prevention, and mitigation issues in the district's facilities. Since then, Dave Hill, Executive Director of Facilities and Operations, and Sid Cumberland, IAQ Coordinator and Safety and Security Coordinator, have sought consultation on IAQ improvements and building design from several organizations, including EPA Region 7, the American Lung Association of Kansas, the Council of Educational Facility Planners International, local architectural and engineering consultants and industrial hygienists. The district provides regular training to operations and maintenance staff on how to identify mold and where to find it. The IAQ Coordinator provides updates to all operations and management staff and also conducts training for new employees on mold identification. The district's industrial hygienist has also provided assistance with training sessions.

Using guidance provided by EPA's *Indoor Air Quality Tools for Schools* Action Kit, the district formed its IAQ team to include people responsible for the day-to-day maintenance and operations of the district's facilities. Ten to twelve team members meet on a monthly basis to discuss IAQ issues and to help monitor conditions in the district's 29 buildings. "The Kit provided the district with an identity and framework for the existing IAQ management program and the checklists helped to organize the team," said Dave Hill. The organization, resources, and credibility of the Kit was of great assistance to boost the district's IAQ management program. The IAQ team modified some checklists to include basic information (e.g., person reporting the concern and person to whom the form is submitted) that made reporting and processing concerns easier.

The district has been fortunate in financing projects: large projects are funded through bond referendums voted on and approved by the school district's patrons. Smaller scale projects are funded through the district's capital outlay funds. The IAQ team prioritizes projects that will improve IAQ. Since 1997, when the district first introduced its "Building Envelope" program, it has invested approximately

20 million in building upgrades and renovations to improve and control IAQ.

In 2001, the district experienced a mold outbreak in an art classroom resulting from a student paper mache class project. The art teacher reported to the IAQ Coordinator health concerns, including head aches and dizziness that she was experiencing in the classroom. The IAQ Coordinator responded immediately by bringing in an industrial hygienist who set up air testing to test for mold spores and carbon dioxide (CO_2) levels. The tests revealed high CO_2 concentrations in the classroom and helped to identify mold sources. The district staff eliminated the mold source and disinfected the classroom. During the incident and mitigation procedures, the school principal communicated with students' parents via voice mail and left the contact number for the IAQ Coordinator should parents have any questions.

Also in 2001, the district experienced an outbreak of Stachybotrys mold in ceiling tiles, the result of a minor roof leak through a pin-sized hole and a clogged drip pan in the ventilation system. As a result, water leaked onto ceiling tiles, causing mold to grow. Maintenance and custodial staff and the IAQ Coordinator responded immediately by cleaning the area, fixing the roof leak, and replacing all regular cellulose tiles with antimicrobial ceiling tiles. They school community was notified of the remedial actions taken to resolve the problem.

In recent years, the district has renovated a few buildings whose original design and construction was of poor quality. In some buildings, the district removed exterior walls and retrofitted the design to ensure proper construction of the wall cavity in order to prevent water intrusion into the building and water absorption by the structural block. Overall, the district has been fortunate not to experience any regular IAQ problems in its facilities. For the few isolated instances, the IAQ team has responded immediately and effectively.

Each of district's four high schools houses a swimming pool, which is used by community residents as well as students. Managing air quality at these indoor swimming pools has posed a greatest challenge that the district has overcome by trial and error. Through this process, the Design and Construction staff and IAQ Coordinator have learned about the successful management of air quality around swimming pools. The main causes of poor IAQ in the pool facilities were improper air circulation, improper amounts of fresh air introduced, and an excessive amount of chloramine gas introduced as a result of excessive pool use.

The district discovered that excessive pool use was causing "off gassing" of chloramine gas, the chemical released as a by product of the reaction between body fluids, such as sweat, and the chlorine chemical in the pool water. The district learned that athletes and community patrons using the pool were often not clean before entering the pool, and excessive sweat and other body fluids increased the amount of chloramine gas expelled into the enclosed facility. To address this problem, the district introduced a supplemental air-handling system and installed fans that help to disperse the chloramine gas (which is most highly concentrated in the two to three feet above the pool surface) from the surface of each pool. The district also installed an ozone-based water filtration system in each pool's mechanical system to improve water clarity and quality and the circulation of the pool's chemicals.

In an effort to improve air quality in other district facilities, the district's maintenance staff has doubled, from two to four times, the frequency that air handling filters are changed during the year. The district also installed an upgraded mechanical systems, re-insulated window frames (also known as mullions), and minimized gaps in door thresholds to reduce the exchange of outdoor and indoor air in several existing facilities. In addition, they installed pre-filters on all room air returns, replaced and upgraded major HVAC units to increase fresh air exchanges, installed CO_2 detectors in new classrooms, and retrofitted several existing classrooms. The new mechanical systems installed at one of the district's high schools saved the district $23,000 in energy costs during the first year alone, in addition to improving IAQ.

The district has instituted several practices and procedures to improve IAQ and overall facility management. It has established a formal protocol for responding to IAQ complaints, new procedures for carpet cleaning and updated general cleaning practices. The facilities director and IAQ Coordinator implemented an extraction method for carpet cleaning, which applies an anti-microbial liquid to the carpet surface to prevent mold and mildew growth during the drying process. The district also makes every effort to use "dry" carpet

cleaning practices where possible. When carpets are damp, air dryers are used until the carpets are completely dry. The district replaced carpet with tile in areas prone to dampness and dirt (e.g., entry areas, drinking fountains, and sinks).

The custodial management team implemented a new standard that requires classrooms to be vacuumed three times per week (instead of two) and high-traffic areas are vacuumed daily. The district has also installed new three-micron HEPA filters on all vacuum cleaners. The district also introduced a "high dusting" program in gymnasiums, common areas, and media centers to prevent dust build up. They have also increased regular dusting in classrooms from two to three times per week. The district has eliminated aerosols from its regular inventory and eliminated their use in regular cleaning practices. The district moved to a water-based gym floor refinishing procedure to reduce the amount of chemicals used in the cleaning process and to reduce the concentration of volatile organic compounds (VOCs) in the buildings.

The district has established an integrated pest management (IPM) program with written procedures for use of pesticides and chemicals in and around school facilities. Pesticides are applied only when students are not in the building. The IAQ Coordinator/Safety and Security Coordinator documents all spray activities, catalogues all chemicals that are sprayed, keeps material safety data sheets (MSDS) tracking products used in the schools, and ensures that the pest control company hired adheres to IPM procedures and uses only those products approved by the district.

The IAQ Coordinator provides checklists to teachers and building principals on an annual basis to conduct a survey of the condition of all the district's buildings. In addition, the IAQ team makes every effort to keep an "open door" policy with all staff and building principals to allow them to report concerns throughout the year, making IAQ management a more effective and collective effort on a day-to-day basis. Using principles underlying the "Building Envelope" program, the IAQ team has helped to instill a sense of personal responsibility in all staff to note and report concerns to the IAQ Coordinator. Concerns are addressed immediately, rather than on a periodic basis, in an attempt to curtail situations before they become crises. The district now makes every effort to ensure buildings meet and exceed industry standards. The IAQ Coordinator also keeps a record of all complaints submitted regarding the district's facilities.

The IAQ team communicates building management activities through email and interoffice mail and relies on each school principal to share information with students' parents. The IAQ team meets regularly with administrators, parent groups (PTO/PTA), and school-site leadership groups as necessary to discuss ongoing and planned IAQ projects. For immediate and serious IAQ threats, the district is able to broadcast announcements by voice/text mail. Less critical information is shared through district newsletters and internal staff newsletters. The IAQ team also produces an annual district edition of "Blue Valley Today" to keep the community updated on the progress of bond-funded projects, including the IAQ management program. School administrative staff made more than 60 presentations to stakeholders in the school community over a two-month period to communicate the importance of no "delayed action" for resolving IAQ problems as they are identified.

Blue Valley's IAQ team has served as an active mentor to neighboring schools and districts in several states, including California, Colorado, Illinois, Kansas, Minnesota, Missouri, Pennsylvania, Texas, and Washington. As such, they discuss best practices and offer ideas on how to address specific IAQ problems. Blue Valley's IAQ team members have consulted with local school districts and helped them to implement strategies to improve IAQ. Team members have established relationships through peer networks and bench marking consortium groups.

Throughout the process of implementing the district's IAQ management program, the IAQ team has maintained regular (internal and external) communication with the members of the school community. Positive communication has improved credibility of the district for responding to complaints and has increased trust from students, staff, parents, and the community. The district has received positive coverage in the local news for proactive efforts to improve IAQ in school facilities. The district's IAQ activities have been highlighted in the Kansas City Star and the Overland Park Sun, and a local cable television station highlighted Blue Valley's experiences in a brief news story.

In October 2003, Blue Valley Unified School District #229 was recognized by EPA with the national *Indoor Air Quality Tools for Schools*

Excellence Award for its proactive approach to addressing IAQ, for the district's exemplary achievements to communicate the importance of good IAQ within the district, and for the partnerships it has established with other districts in neighboring states.

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